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Notes:

1. Untranslatable words are replaced with asterisks (****).
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Translated: 00:35:06 JST 11/07/2008

Dictionary: Last updated 10/08/2008 / Priority: 1. Information communication technology (ICT)

FULL CONTENTS

[Claim(s)]

[Claim 1] The optical recording medium characterized by having the composition which sees from optical plane of incidence, and for which information is recorded on an outside recording layer one by one from an inside recording layer.

[Claim 2] In the optical recording medium which performs record and reproduction of information to the recording layer which had two or more laminated recording layers, entered and chose light from the field of one side Said each recording layer is divided into a sector unit, and the information about a sector number is given to each sector. The optical recording medium characterized by the minimum sector number which sees from optical plane of incidence between said adjoining recording layers, and is given to the sector on the recording layer by the side of the back being larger than the greatest sector number given to the sector on the recording layer by the side of this side.

[Claim 3] In the optical recording medium which performs record and reproduction of information to the recording layer which had two or more laminated recording layers, entered and chose light from the field of one side Said each recording layer is an optical recording medium characterized by being divided into a sector unit, giving the information about a sector number, and the identification information for identifying each recording layer to each sector, and giving the respectively same sector number to the sector to which said each recording layer corresponds.

[Claim 4] The optical recording medium characterized by having two or more laminated recording layers, seeing from optical plane of incidence in the optical recording medium which performs record and reproduction of information to the recording layer which entered and chose light from the field of one side, and carrying out Sir tee FAI only of the recording layer of most this side.

[Claim 5] In the optical recording regenerative apparatus which performs record and reproduction of information to the recording layer which entered and chose light from the field of one side of an optical recording medium which has two or more laminated recording layers The optical recording regenerative apparatus characterized by seeing from the optical plane of incidence of said optical recording medium, and recording information on the recording layer by the side of the back in order from the recording layer by the side of this side.

[Claim 6] The optical recording regenerative apparatus according to claim 5 characterized by said recorded information being information aiming at the defect inspection of an optical recording medium.

[Claim 7] The optical recording regenerative apparatus according to claim 5 or 6 characterized by said recorded information being user data.

[Claim 8] In the optical recording regenerative apparatus which performs record and reproduction of information to the recording layer which entered and chose light from the field of one side of an optical recording medium which has two or more laminated recording layers See from the optical plane of incidence of said optical recording medium, and consecutive number attachment is carried out at turn from the recording position field of the beginning of the recording layer by the side of this side to the recording position field of the last of the recording layer by the side of the back. The optical recording regenerative apparatus characterized by recording data from the recording position field of the number of the beginning of the recording layer by the side of said back after record to the recording position field of the number of the last of the recording layer by the side of said this side is completed.

[Claim 9] In the optical recording regenerative apparatus which performs record and reproduction of information to the recording layer which entered and chose light from the field of one side of an optical recording medium which has two or more laminated recording layers The same recording position field number as the identification information which sees from the optical plane of incidence of said optical recording medium, and identifies the recording layer by the side of this side and the recording layer by the side of the back, respectively is attached. The optical recording regenerative apparatus characterized by recognizing the identification number of the recording layer by the side of said this side, performing Data Recording Sub-Division from the recording position field of the beginning of the recording layer by the side of said this side, recognizing the identification number of the recording layer after completion of record to the recording layer by the side of said this side, and by the side of said back, and performing Data Recording Sub-Division from the recording layer by the side of said back.

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to an optical recording medium and an optical recording regenerative apparatus especially the optical recording medium that has a multilayer recording layer, and an optical recording regenerative apparatus.

[0002]

[Description of the Prior Art] In DVD-RAM which is the erasable optical disk of an optical recording medium, for example, a phase change method, record of information is performed by changing the optical intensity which carries out condensing irradiation, and forming a phase change mark array on a disk. On the other hand, playback of information carries out the condensing irradiation of the light of fixed intensity lower than the case of record on a disk, and is performed by detecting a phase change mark array from the amount of reflected lights.

[0003] As a method of improving the storage capacity of 1 optical disks of this RAM evening IPU, one side two-layer-ization which carried out the two-layer laminating of the record film can be considered. This follows the one side two-layer technique adopted with DVD-ROM which is an optical disk only for playback, makes illuminating radiation condense from the same side to the disk manufactured by separating between two recording layers by a hyaline layer, and performs record reproduction in which or the selected recording layer.

[0004]

[Problem to be solved by the invention] In the above-mentioned conventional system, it sees from optical incidence and record reproduction of the recording layer by the side of the back is performed

through the recording layer by the side of this side. Since data is beforehand fixed in the whole surface by unevenness when the recording layer by the side of this side is a recording layer of ROM evening IPU, this side side recording layer permeability of the incidence light to the recording layer by the side of the back and the reflected light from the recording layer by the side of the back becomes almost the same all over a disk. However, when the recording layer by the side of this side is a recording layer of RAM evening IPU, data is not necessarily equally recorded on the whole surface. Since the permeability differs in the state of the field which the record reproduction light by the side of the back on this side side recording layer penetrates by an un-recording or record settled, the following faults occur.

[0005] 1) Since the record luminous intensity which penetrates this side side recording layer and reaches to the recording layer by the side of the back is changed, the recording mark formed becomes irregular and record stability is spoiled.

[0006] 2) Since the intensity of the regenerated light which penetrates this side side recording layer, reaches the recording layer by the side of the back, is reflected by the recording layer by the side of the back, and penetrates this side side recording layer again is changed, it becomes easy to produce a reproduction error and reproduction stability is spoiled.

[0007] For this reason, in the conventional optical recording medium, in order to improve storage capacity, when it becomes one side two-layer, record and reproduction stability are spoiled.

[0008] This invention aims at offering the optical recording medium and optical recording regenerative apparatus which enable one side two-layer-ization, without spoiling record and reproduction stability.

[0009]

[Means for solving problem] This invention offers the optical recording medium characterized by having two or more laminated recording layers, and having the composition which is seen from optical plane of incidence, and by which information is recorded one by one on an outside recording layer from an inside recording layer in the optical recording medium which performs record and reproduction of information to the recording layer which entered and chose light from the field of one side.

[0010] In the optical recording regenerative apparatus which performs record and reproduction of information to the recording layer which entered and chose light from the field of one side of an optical recording medium which has two or more recording layers by which this invention was laminated The optical recording regenerative apparatus characterized by seeing from the optical plane of incidence of said optical recording medium, and recording information on an outside recording layer in order from an inside recording layer is offered.

[0011]

[Mode for carrying out the invention] (The 1st embodiment) With reference to Drawings, the 1st embodiment of the equipment by this invention is explained hereafter.

[0012] In drawing 1, the optical disk 11 which is the Information Storage Division medium has the one side two-layer type structure which carried out the two-layer laminating of the same phase change type record film as DVD-RAM. The hyaline layer 14 intervenes between the 1st lower recording layer 12 and the 2nd upper recording layer 13. That is, a hyaline layer 14 is intervened and the 1st and 2nd recording layers 12 and 13 are laminated. Illuminating radiation 15 is irradiated from the bottom to such an optical disk 11, and record reproduction is performed only to the recording layer which was chosen in which of the 1st or the 2nd recording layer with the objective lens 16, while was condensed and chosen.

[0013] Record of data modulates illuminating radiation intensity by operation of a recording system 17, and playback of data is performed by operation of a playback system 18 by extracting from the reflected

light of an optical disk.

[0014] The servo system 19 performs position control which includes the optical system of an objective lens etc. with the roll control of a motor 20, and performs selection and flattery operation of a recording layer and a truck. Equipment [all] operation of these is performed under management of a controller 21.

[0015] In the optical disk in this invention, when performing record reproduction of the 2nd recording layer 13, data shall be recorded on the 1st recording layer 12. That is, the field on the 1st recording layer 12 which the illuminating radiation 15 currently condensed by the record reproduction field 22 on the 2nd recording layer 13 penetrates is characterized by being in the Data Recording Sub-Division finishing field 23.

[0016] It sees from [of an optical disk] incidence, and by the case where it is after the case where this side side 12, i.e., the 1st recording layer, has not been recorded, and record, the permeability of light differs, and if this is intermingled, the back side, i.e., record of the 2nd recording layer 13, and reproductive reliability will be spoiled, as stated to the clause of the conventional technology. In the example by which a society announcement was made, the crystal state permeability of the 1st recording layer is 45%, and amorphous state permeability is 70% (ISOM'98, collection ploff drafts44). Since the transmitted light on the 1st recording layer has spread considerably rather than mark size at the time of condensing to the 2nd recording layer, the permeability in the recorded field of the 1st recording layer becomes about 57.5% of the average of the permeability of the crystal which is a recording mark and which is a space as it is amorphous. On the other hand, the permeability of a non-record section is 45% of a crystal state, and differs from the permeability of a recorded field clearly. The record reproduction of the 2nd recording layer which does not have such mixture and was always stabilized in this invention is possible.

[0017] Next, how to realize such an optical disk is explained. Although the 1st recording layer and the 2nd recording layer are stuck after forming membranes on a substrate, respectively, complete crystallization is given and it is completed, in order for a general user to actually use it as a record medium which records user data, initialization of a medium is required for an one side two-layer RAM type optical disk. Although this writes in the logical format corresponding to the user's system, defective sector inspection called Sir tee FAI is also conducted if needed. This inspection distinguishes poor sector ID and the overdata error sector on an optical disk, it is operation for specifying it as the object of alternating processing, and record reproduction of predetermined data is performed into all the data storage area sectors.

[0018] In this invention, as shown in drawing 2 (a), record of data is certainly performed from the 1st recording layer 12, and as shown in drawing 2 (b) after the recording end of the 1st recording layer 12, it shifts to the 2nd recording layer 13. Thereby, when performing Data Recording Sub-Division reproduction for defect inspection to the 2nd recording layer 13, to the 1st recording layer 12, the state where the data for defect inspection is recorded on the whole surface can be realized. This defect inspection may be, in case [both] the user who purchased carries out with his own record reproduction equipment, the case where it is carried out in advance of shipment in an optical disk maker, and. Although rewriting is arbitrarily performed in the user busy condition after inspection as for the data of the 1st recording layer 12 and the 2nd recording layer 13 In order not to return to the complete crystal state which is a non-recorded state, the state where data was recorded all over the 1st recording layer 12 is maintained, and the reliability in the record reproduction of the 2nd recording layer 13 is not spoiled.

Although it is also possible that the field where data is not written by track of for example, the sector poor ID was strictly proved at the Data Recording Sub-Division time of a under [defect inspection] that it is, and the zone boundary etc. exists in the 1st recording layer 12 As above-mentioned, on the 1st recording layer 12, since the transmitted light has spread considerably rather than mark size, if it has not recorded [partial], it will be satisfactory at the time of condensing to the 2nd recording layer 13.

[0019] By the above-mentioned embodiment, the turn of defect inspection was explained to be the 2nd recording layer 13 from the 1st recording layer 12 in initialization of the non-recorded state disk with which the optical disk was crystallized completely [after-manufacture]. On the other hand, when only a logical format is performed in initialization and defect inspection is not conducted, direct user data is newly recorded on the sector of a non-recorded state. Also in this case, the effect of this invention can be acquired by specifying record turn as the 2nd recording layer 13 from the 1st recording layer 12. For example, the information about a sector number is given to the sector of both recording layers by the prepit etc. so that the sector number of an entire disk may increase in order of the 1st recording layer 12 to the 2nd recording layer 13, and as for defect inspection and new data record operation, this sector numerical order, then equipment control become easy. Moreover, even when the sector number given by PURIBITTO etc. overlaps in both recording layers, it is an equipment control side and the same effect can be acquired by adding and recognizing offset, for example, the most significant bit, for the sector number of the 2nd recording layer.

[0020] In addition, although the case where the 1st recording layer 12 and the 2nd recording layer 13 are recording toward the perimeter from inner circumference is expressed with drawing 1 and drawing 2, even if the order of record within each recording layers, such as the other case, differs from this in the 2nd recording layer 13 from the perimeter to inner circumference with the method of the disk, operation of this invention is possible.

[0021] Next, an example of record operation which starts record is explained with reference to the flow chart of drawing 3 from the 1st recording layer.

[0022] Access to the 1st recording layer 12 is first performed after a start (S1). This access converges illuminating radiation on the 1st recording layer 12, and is performed by reading predetermined recorded information. It is judged [whether the 1st recording layer has recorded and] by this access (S2). If this judgment is YES, Data Recording Sub-Division to the 1st recording layer 12 will be performed (S3). Then, completion of record of the 1st recording layer 12 is judged (S4). Access to the 2nd recording layer 13 is performed as this judgment is YES (S5). The objective lens 16 is controlled by access to this 2nd recording layer 13 by the servo system 19 so that illuminating radiation 15 converges on the 2nd recording layer 13. Then, Data Recording Sub-Division is performed to the 2nd recording layer 13 (S6).

[0023] On the other hand, in Step S2, if judged [having recorded the 1st recording layer 12 and], it will be judged first whether record of the 1st recording layer 12 is completed (S7). Processing progresses that this judgment is YES to the access operation of the 2nd recording layer 13 of Step S5. The non-record section of the 1st recording layer 12 is accessed as judgment is NO (S8), and Data Recording Sub-Division is performed to this non-record section (S9). If the non-record section of the 1st recording layer 12 is completed and judgment of Step S7 serves as YES, it will progress to Step S5 and access to the 2nd recording layer 13 will be performed.

[0024] Record of the 1st recording layer 12 is performed first as mentioned above, and then record to the 2nd recording layer 13 is performed. Such control is performed by the controller 21.

[0025] In the above-mentioned record operation, access is controlled by various forms by the address

information form of the 1st and 2nd recording layers 12 and 13 of the optical disk 11 on the occasion of access to the 1st recording layer 12 and the 2nd recording layer 13. For example, when set up with the consecutive number from the first address, for example, sector number, of the 1st recording layer 12 to the sector number of the last of the 2nd recording layer 13, Identification information may be given to the 1st and 2nd recording layers 12 and 13, respectively, and an address number may be attached so that each sector may begin from No. 1. When the consecutive number is set up, an access control can be carried out so that Data Recording Sub-Division can be performed from the sector of the number of the beginning of the 2nd recording layer after record into the sector of the last number of the 1st recording layer 12 is completed.

[0026] When identification information is attached, the identification information of the 1st recording layer is recognized and Data Recording Sub-Division is performed from the number of the beginning of the 1st recording layer (sector number), for example, No. 1. If record into the sector of the number of the last of this 1st recording layer is completed, the identification number of the 2nd recording layer will be recognized and Data Recording Sub-Division will be performed from the sector of No. 1 of the 2nd recording layer.

[0027] Thus, an access control can be performed by specifying ***** for optical disks and the following arbitrary sectors to which a sector number attaches to and the 1st and 2nd recording layers are carried out [both] from No. 1. For example, the sector of No. 5 of the 1st recording layer is accessed first to record data on the sector of No. 5. If data is recorded on this sector of No. 5 at this time, the sector of No. 5 of the 2nd recording layer is accessed, and Data Recording Sub-Division can be performed into the sector of No. 5 of the 2nd recording layer. That is, if data is recorded on the 1st recording layer, the record section (sector) of the 2nd recording layer can be specified arbitrarily. In this case, even if a ***** field is in the 1st recording layer, it becomes recordable to the 2nd recording layer.

[0028] [according to the above-mentioned embodiment, have explained as what certainly performs Data Recording Sub-Division from the 1st recording layer irrespective of whether Sir tee FAI of the optical disk is carried out, but] Since Data Recording Sub-Division of the 1st recording layer is substantially carried out if Sir tee FAI of the 1st recording layer is carried out, it is not necessary to necessarily perform Data Recording Sub-Division from the 1st recording layer. Therefore, the effect of this invention can be acquired by using the optical recording medium which carried out Sir tee FAI only of the 1st recording layer with two-layer structure.

[0029]
[Effect of the Invention] It is possible to offer the optical recording medium and optical recording regenerative apparatus which have the optical recording regenerative function which enables one side two-layer-ization, without spoiling record and reproduction stability according to this invention, as explained above.

[Brief Description of the Drawings]

[Drawing 1] The block diagram of the optical recording regenerative apparatus of the 1st embodiment of this invention.

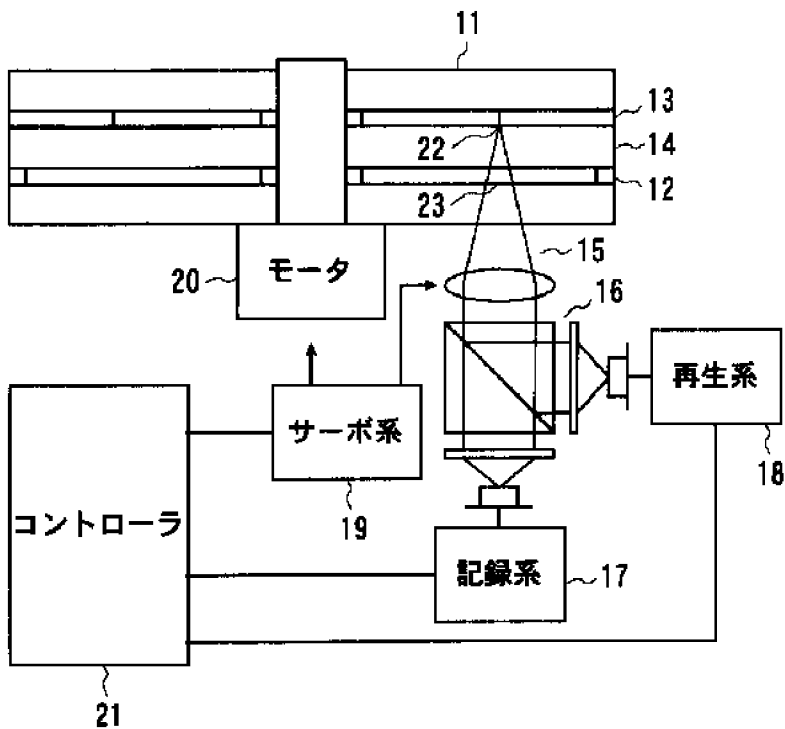
[Drawing 2] The Data Recording Sub-Division operation explanatory view in the 1st embodiment.

[Drawing 3] The flow chart for explaining Data Recording Sub-Division operation.

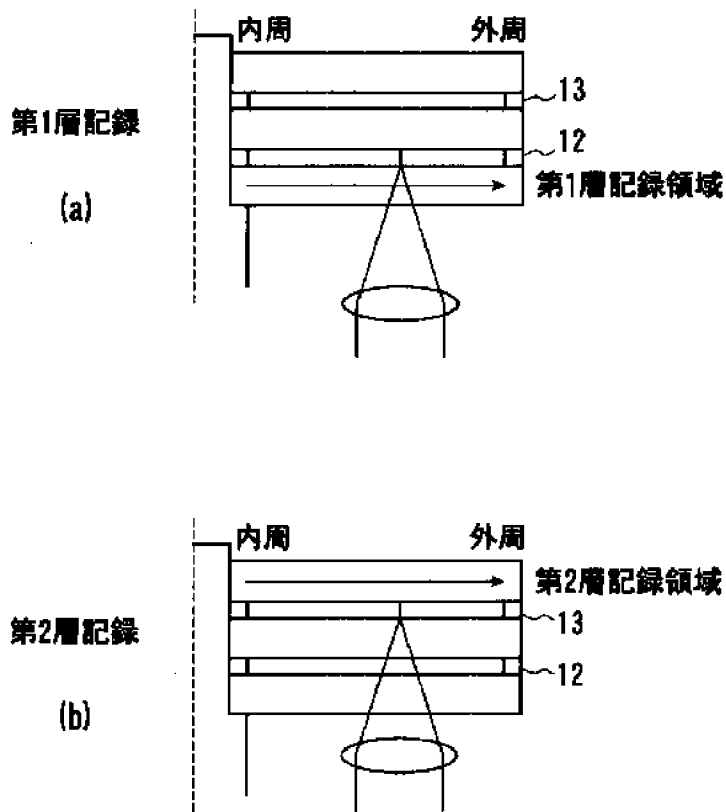
[Explanations of letters or numerals]

- 11 -- Optical disk
- 12 -- The 1st recording layer
- 13 -- The 2nd recording layer
- 14 -- Hyaline layer
- 15 -- Illuminating radiation
- 16 -- Objective lens
- 17 -- Recording system
- 18 -- Reproduction system
- 19 -- Servo system
- 20 -- Motor
- 21 -- Controller
- 22 -- Record reproduction field
- 23 -- Recorded field

[Drawing 1]



[Drawing 2]



[Drawing 3]

